PATENT ABSTRACTS OF JAPAN

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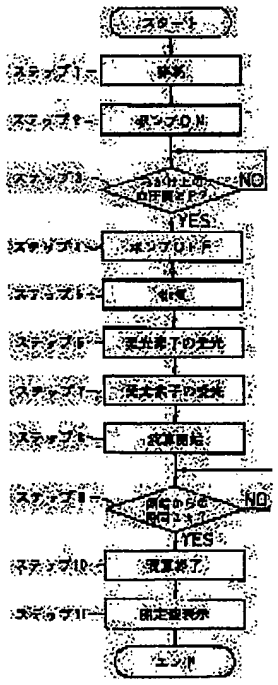
(54) BODY FLUID ANALYZER

(57)Abstract:
PROBLEM TO BE SOLVED: To automatically and continuously perform a series of processes required for measurement by pressurizing a pressure band (cuff) for making body fluid come out from a punctured finger, optically detecting information relating to the body fluid which comes out from the finger, displaying a measured value decided by the result and performing control by a computer.
SOLUTION: After a puncturing blade is projected, a pump is driven (S1-S2) and the cuff is pressurized. The cuff pressurizes the finger and squeezes out the body fluid from the damaged skin. When an apparent blood pressure reaches a prescribed value P by the pressure of the cuff, judgement is turned to YES (S3). When the drive of the pump is stopped corresponding to the judgement (S4), air inside the cuff is promptly exhausted (S5). When the squeezed body fluid reaches a detection part, a light emitting element emits light and the light is reflected in the detection part and received in a light receiving element (S6-S7). Output from the light receiving element is sent to the computer, an arithmetic operation started, and when the arithmetic operation is ended after the lapse of the time (t), the measured value is displayed at a display part (S8-S11).



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TECHNICAL FIELD

[Field of the Invention] This invention relates to the body fluid analysis apparatus which can perform a series of processes automatically and continuously especially about the body fluid analysis apparatus which can analyze the detected matter contained in body fluid, such as the blood sugar level.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] Conventionally, when the blood sugar level etc. was measured, it was carrying out by making the blood drop adhere to the test piece with which attached the blemish to the finger, the overarm, the antinode, the hip, etc. using the reusable puncture instrument (Lancet), pressed out the blood drop from there, picked out from the wrapping material, and the sensor was equipped. However, there was a problem that it was very troublesome to press out the blood drop of a complement oneself to measurement, and there was much actuation which is required of an operating personnel in performing a series of processes if the reusable puncture instrument and the sensor have dissociated, and measuring was complicated.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to the equipment of this invention, a series of processes which measurement takes can be performed automatically and continuously, and body fluid can be analyzed that it is simple and quickly.

[Translation done.]

JAPANESE [JP,09-294737,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

MEANS

[Means for Solving the Problem] An example is taken by the above-mentioned technical problem. Wholeheartedly as a result of research this invention person etc. The tourniquet (cuff) and its pressurization means for making body fluid bleed from a puncture means and the finger which carried out the puncture, By storing a means to detect optically the information about the body fluid which bled from the finger, a means to determine measured value from the detected result, the drop that displays the determined measured value in one equipment, and controlling by the computer A series of processes which measurement takes could be performed automatically and continuously, and a header and this invention were completed for the ability of body fluid to be analyzed that it is simple and quickly.
[0005] That is, this invention is a body-fluid analysis apparatus which has the puncture means which carries out the puncture of the finger, the tourniquet for pressing said finger, a pressurization means supply air to said tourniquet, an exhaust-air means exhaust the air of said tourniquet, a means detect optically the information about the body fluid which bled from the finger, a means determine measured value from the detected result, and the drop that displays the determined measured value.
[0006] Moreover, a puncture means by which this invention carries out the puncture of the finger and tourniquet for pressing said finger (cuff), A pressurization means to supply air to said cuff, and an exhaust air means to exhaust the air of said cuff, It is the body fluid analysis apparatus which has a means to change so that the information about the body fluid which bled from the finger can be detected optically, a means to detect the information about the changed body fluid optically, a means to determine measured value from the result detected optically, and the drop that displays the determined measured value. Furthermore, this invention is the body fluid analysis apparatus which applied to the above-mentioned body fluid analysis apparatus the pressure sensor which detects the pressure of a cuff further.

[Translation done.]

JAPANESE [JP,09-294737,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective view showing an example of the body fluid analysis apparatus of this invention.
[Drawing 2] It is drawing showing the puncture section in the body fluid analysis apparatus of this invention.
[Drawing 3] It is drawing showing the base in a body fluid analysis apparatus, the puncture cutting edge, test piece, and covering member of this invention. (a) It is drawing seen from the ******** side, and is (b). It is drawing showing the condition that the puncture cutting edge projected, and is (c). It is drawing seen from the test piece installation side.
[Drawing 4] It is drawing showing an example of the test piece of this invention. (a) It is a ****** perspective view and is (b). It is the A-A' sectional view of the test piece shown in (a).
[Drawing 5] It is drawing showing an example of a test piece which prepared the degassing section in the test piece in drawing 4 . (a) It is a ****** perspective view and is (b). (a) It is the B-B' sectional view of the test piece shown.
[Drawing 6] It is drawing showing other examples of the test piece of this invention. (a) It is a ****** perspective view and is (b). (a) It is the C-C' sectional view of the test piece shown.
[Drawing 7] It is drawing showing an example of a test piece which prepared the degassing section in the test piece in drawing 6 . (a) It is a ****** perspective view and is (b). (a) It is the D-D' sectional view of the test piece shown.
[Drawing 8] It is drawing showing another example of the test piece of this invention. (a) It is a ****** perspective view and is (b). (a) It is the E-E' sectional view of the test piece shown.
[Drawing 9] It is the decomposition perspective view showing the base in a body fluid analysis apparatus, the puncture cutting edge, test piece, and covering member of this invention.
[Drawing 10] It is the perspective view showing signs that the light irradiated from the light emitting device reflects in the detection section of a test piece, and is received by the photo detector.
[Drawing 11] It is drawing showing an example of the optical system in the body fluid analysis apparatus of this invention.
[Drawing 12] It is drawing showing other examples of the optical system in the body fluid analysis apparatus of this invention.
[Drawing 13] It is the block diagram showing an example of the circuitry of the body fluid analysis apparatus of this invention.
[Drawing 14] It is the flow chart which shows an example of actuation of the body fluid analysis apparatus in drawing 1 .
[Drawing 15] It is drawing showing other examples of step 3 in the flow chart of drawing 14 .
[Drawing 16] It is the flow chart which shows other examples of actuation of the body fluid analysis apparatus in drawing 1 .

[Description of Notations]
1 -- Body fluid analysis apparatus
11 -- Casing
2 -- Binding section
21 -- Cuff
3 -- Puncture section
30 -- Photosensor section
31 -- Light emitting device
32 -- Photo detector
33 -- Prism
4 -- Drop
51 -- Main switch
52 -- Puncture switch
7 -- Base
70 -- Detection section
71 -- Puncture cutting edge
72, 72A, 72', 72A', and 72 -- ' -- ' -- test piece
72a, 72Aa, 72a', 72Aa', and 72a -- ' -- ' -- base material
72b, 72Ab, 72b', 72Ab', and 72b -- ' -- ' -- spacer
72c, 72Ac, 72c', 72Ac', and 72c -- ' -- ' -- covering
72d, 72Ad -- Filter pad
72e -- Reflecting layer
700 -- Through Tube
720,720A -- Notching section
721,721A, 723 -- Slit
722 -- Punching Section
724 -- Sample Cell
73 -- Covering member
74 -- Flat spring
8 -- Arm member
9 -- Solenoid

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the body fluid analysis apparatus which can perform a series of processes automatically and continuously especially about the body fluid analysis apparatus which can analyze the detected matter contained in body fluid, such as the blood sugar level.
[0002]
[Description of the Prior Art] Conventionally, when the blood sugar level etc. was measured, it was carrying out by making the blood drop adhere to the test piece with which attached the blemish to the finger, the overarm, the antinode, the hip, etc. using the reusable puncture instrument (Lancet), pressed out the blood drop from there, picked out from the wrapping material, and the sensor was equipped. However, there was a problem that it was very troublesome to press out the blood drop of a complement oneself to measurement, and there was much actuation which is required of an operating personnel in performing a series of processes if the reusable puncture instrument and the sensor have dissociated, and measuring was complicated.
[0003]
[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the convenient body fluid analysis apparatus which can perform a series of processes which measurement takes automatically and continuously.
[0004]
[Means for Solving the Problem] An example is taken by the above-mentioned technical problem. Wholeheartedly as a result of research this invention person etc. The tourniquet (cuff) and its pressurization means for making body fluid bleed from a puncture means and the finger which carried out the puncture, By storing a means to detect optically the information about the body fluid which bled from the finger, a means to determine measured value from the detected result, the drop that displays the determined measured value in one equipment, and controlling by the computer A series of processes which measurement takes could be performed automatically and continuously, and a header and this invention were completed for the ability of body fluid to be analyzed that it is simple and quickly.
[0005] That is, this invention is a body-fluid analysis apparatus which has the puncture means which carries out the puncture of the finger, the tourniquet for pressing said finger, a pressurization means supply air to said tourniquet, an exhaust-air means exhaust the air of said tourniquet, a means detect optically the information about the body fluid which bled from the finger, a means determine measured value from the detected result, and the drop that displays the determined measured value.
[0006] Moreover, a puncture means by which this invention carries out the puncture of the finger and tourniquet for pressing said finger (cuff), A pressurization means to supply air to said cuff, and an exhaust air means to exhaust the air of said cuff, It is the body fluid analysis apparatus which has a means to change so that the information about the body fluid which bled from the finger can be detected

optically, a means to detect the information about the changed body fluid optically, a means to determine measured value from the result detected optically, and the drop that displays the determined measured value. Furthermore, this invention is the body fluid analysis apparatus which applied to the above-mentioned body fluid analysis apparatus the pressure sensor which detects the pressure of a cuff further.

[0007]

[Function] The puncture means which carries out the puncture of the finger, the cuff for pressing said finger, and a pressurization means to supply air to said cuff, An exhaust air means to exhaust the air of said cuff, and a means (or a means to detect optically the information about a means to change so that the information about the body fluid which bled from the finger can be detected optically, and the changed body fluid) to detect optically the information about the body fluid which bled from the finger, According to the body fluid analysis apparatus of this invention which has a means to determine measured value from the result detected optically, and the drop which displays the determined measured value After carrying out the puncture of the finger, press by the cuff which pressurized the finger and body fluid is made to bleed. Since a cuff is loosened and a finger is opened wide, and required information can be optically detected from the obtained body fluid, measured value can be determined and it can display on a drop with exhaust air after bleeding, A series of processes which measurement takes can be performed automatically and continuously, and body fluid can be analyzed that it is simple and quickly.

[0008] The body fluid of optimum dose can be pressed out from a finger, without being able to set the upper limit of the pressure of a cuff to the above-mentioned body fluid analysis apparatus, and giving a superfluous feeling of oppression to it irrespective of the size of the finger of an operating personnel, at an operating personnel by applying the pressure sensor which detects the pressure of a cuff further.

[0009]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail with reference to a drawing. Here, the body fluid in this invention means the liquid which may bleed from a living body by carrying out a puncture, for example, blood, the decoction between cells, etc. are mentioned.

[0010] The perspective view of a body fluid analysis apparatus with an example of this invention is shown in drawing 1 . This body fluid analysis apparatus 1 has the method object of merit-like casing 11, and the binding section 2, the puncture section 3, the photosensor section 30, the indicator 4, the main switch 51, and the puncture switch 52 are formed in that casing 11. In this example, the light emitting device 31 and the photo detector 32 are used as the photosensor section 30.

[0011] As for the binding section 2, the finger has become cylinder-like so that may be inserted into it, and the cuff (tourniquet) 21 which presses a finger is formed in the interior of the binding section 2. This cuff 21 can use impregnation and exhaust air of the air by the cuff driving gear (not shown), and can press and open a finger now. The cuff driving gear has the sensor (pressure sensor) which detects the pressure of a cuff 21, the solenoid valve, the pump, and the leak valve, and they are open for free passage to the cuff 21 through the rubber tube. This cuff driving gear is controlled by the computer (not shown) formed in the interior of the body fluid analysis apparatus 1.

[0012] The puncture cutting-edge driving gear 9 which has the arm member 8 which grasps the base 7 and the puncture cutting edge 71 which have the puncture cutting edge 71, a test piece 72, and the covering member 73 as shown in drawing 2 is installed in the puncture section 3. The puncture cutting edge 71 is formed in one base 7 side possible [advance and retreat] (drawing 3 (a) and (b)), and the test piece 72 and the covering member 73 are formed in the another side side (drawing 3 (c)). Moreover, the flat spring 74 is installed in front both the sides of a base 7, and the projected puncture cutting edge 71 can be retreated to an early location.

[0013] using the thing made from stainless steel in consideration of sanitary safety, although the puncture cutting edge 71 may be what kind of thing as long as it can carry out the puncture of the finger

and it can make it bleed -- desirable -- a commercial thing -- for example, -- Feather Safety Razor Shrine make Blood Lancets etc. can be used. Moreover, not only a cutting-edge-like thing but a needlelike thing can also be used.

[0014] A means to enable it to detect optically the information about the body fluid which bled from the finger is formed in the test piece 72. There are a means to change so that the information about the body fluid which bled from ** finger can be detected optically, and a means to enable it to detect directly optically the information about the body fluid which bled from ** finger as such a means.

[0015] ** The color reaction which used various catalysts can be used for a means. ** An example using a means of a test piece 72 is shown in drawing 4 . Drawing 4 (a) It is the decomposition perspective view of a test piece 72, and is drawing 4 (b). (a) It is the A-A' sectional view of the test piece 72 shown. The test piece 72 by this example comes to carry out the laminating of base material 72a, spacer 72b, and the covering 72c to the order. The notching section 720 which the detection section 70 to which the ink which carries out the catalyst of the above-mentioned color reaction was applied (printing) is formed in base material 72a, and was cut and lacked to the part corresponding to the above-mentioned detection section 70 in spacer 72b It is formed. This notching section 720 It can become the passage of body fluid.

[0016] Although especially the quality of the material of base material 72a, spacer 72b, and covering 72c is not limited, it is necessary to produce base material 72a with a transparent ingredient, for example, transparent plastics, glass, etc., optically. Especially if the coloration in the detection section 70 is optically detectable with a light emitting device 31 and a photo detector 32, it will not be limited, but the thickness of a base material 72 is specifically 50-500. mum grade is desirable. Moreover, for the thickness of spacer 72b, body fluid is the notching section 720 by capillarity etc. Especially if it passes and the detection section 70 can be reached, it will not be limited, but it is specifically 50-500. mum grade is desirable. For the thickness of covering 72c, the body fluid which carried out the puncture and bled with the puncture cutting edge 71 is the notching section 720 of spacer 72b. Especially if it is the thickness which can flow, it will not be limited, but it is specifically 50-500. mum grade is desirable.

[0017] Especially if coloration can be carried out as ink which can be used for the detection section 70 according to the class of detected matter in body fluid, concentration, etc., it will not be limited, but the ink containing an enzyme, an antibody, a microorganism, etc. can be used suitably. For example, the constituent which contains glucose oxidase, a p-nitroso-screw (beta-hydroxyethyl) aminobenzene hydrochloride, molybdophosphoric acid, support, and an organic solvent in measuring the blood sugar level, glucose oxidase and a peroxidase, 4-aminoantipyrine, N-ethyl-N -(2-hydroxy-3-sulfopropyl)- The constituent containing meta toluidine, support, and an organic solvent etc. can be used as ink. If the former constituent reacts with blood sugar, yellow orange will be presented, and if the latter constituent reacts with blood sugar, it will present a purplish red color. What is necessary is just to use what is usually used as support and an organic solvent.

[0018] That what is necessary is just to perform spreading and printing of ink with a conventional method, you may apply with a dispenser etc. and may print by screen printing, gravure, the ink jet method, etc. According to the test piece 72 in this example, it is drawing 4 (b). Body fluid is the notching section 720 by capillarity etc. so that it may be shown. It passes and reaches to the detection section 70, and it reacts with the above ink and coloration is carried out. It reflects in the detection section 70 and the light irradiated from the light emitting device 31 is received by the photo detector 32. It can measure about the detected matter in body fluid by detecting the amount of increase and decrease of the reflectivity in a certain wavelength field which changes according to color reaction by the above-mentioned photo detector 32.

[0019] In addition, the degassing section may be prepared in a test piece 72 so that body fluid may tend to flow. An example (test piece 72A) of such a test piece is shown in drawing 5 . Drawing 5 (a) Test piece 72A It is a decomposition perspective view and is drawing 5 (b). (a) Test piece 72A shown It is a B-B' sectional view. Test piece 72A by this example It comes to carry out the laminating of base

material 72Aa, spacer 72Ab, and the covering 72Ac to the order. Detection section 70A by which the ink which carries out the catalyst of the color reaction was applied to base material 72Aa (printing) Through tube 700 which becomes the width with the degassing section It is prepared and is the above-mentioned through tube 700 in spacer 72Ab. Notching section 720A cut and lacked to the corresponding part is formed.

[0020] test piece 72A in this example if it depends -- drawing 5 R> 5 (b) it is shown -- as -- body fluid -- capillarity etc. -- notching section 720A -- passing -- detection section 70A up to -- the air which existed in notching section 720A at this time although reached -- through tube 700 since it leads and is discharged outside -- body fluid -- detection section 70A up to -- it is easy to reach.

[0021] ** Other examples (test piece 72') of the test piece using a means are shown in drawing 6 . Drawing 6 (a) It is the decomposition perspective view of test piece 72', and is drawing 6 (b). (a) It is the C-C' sectional view of test piece 72' shown. Test piece 72' by this example is [base material 72a' and] a slit 721. And the punching section 722 The laminating of spacer 72b' which it has, and covering 72c' is carried out to the order, and it is the above-mentioned punching section 722. It comes to insert filter pad 72d. Detection section 70' is prepared in the punching section 722 and the part corresponding to filter pad 72d, and the ink which carries out the catalyst of the color reaction is applied to base material 72a' (printing).

[0022] If body fluid can be absorbed and held, the filter pad 72d quality of the material may be what kind of thing, for example, a nonwoven fabric, paper, the felt, absorbent cotton, etc. can be used for it. According to test piece 72' in this example, it is drawing 6 (b). Body fluid is a slit 721 by capillarity etc. so that it may be shown. It passes and is absorbed by filter pad 72d, and it reacts with the ink applied to the detection section 70 (printing), and coloration is carried out. It reflects by detection section 70', and the light irradiated from the light emitting device 31 is received by the photo detector 32.

[0023] In addition, the degassing section may be prepared so that body fluid may tend to flow also into this test piece 72'. An example (test piece 72A') of such a test piece is shown in drawing 7 . Drawing 7 (a) It is the decomposition perspective view of test piece 72A', and is drawing 7 (b). (a) It is the D-D' sectional view of test piece 72A' shown. this example -- depending -- a test piece -- 72 -- A -- ' -- a base material -- 72 -- Aa -- ' -- a slit -- 721 -- A -- 723 -- and -- punching -- the section -- 722 -- A -- having -- a spacer -- 72 -- Ab -- ' -- covering -- 72 -- Ac -- ' -- the order -- a laminating -- carrying out -- the above-mentioned punching section 722A -- filter pad 72Ad -- inserting -- becoming . Slit 723 which detection section 70A' by which the ink which carries out the catalyst of the color reaction was applied to base material 72Aa' (printing), and through tube 700' which becomes the degassing section at the width are prepared, and extends in spacer 72Ab' to the part corresponding to this through tube 700' from punching section 722A It is formed.

[0024] According to test piece 72A' in this example, as shown in drawing 7 R> 7 (b), body fluid is absorbed by filter pad 72Ad through slit 721A by capillarity etc., and carry out coloration by detection section 70A', but The air which existed in slit 721A and punching section 722A at this time is a slit 723. And since it is discharged through through tube 700' outside, body fluid tends to reach to filter pad 72Ad (detection section 70A').

[0025] On the other hand, the approach of detecting attenuation of the light transmission in body fluid can be used for the means of **. ** An example (test piece 72") using a means of a test piece is shown in drawing 8 . Drawing 8 (a) It is the decomposition perspective view of test piece 72", and is drawing 8 R> 8 (b). (a) It is the test piece 72 'E-E of " sectional view shown. Test piece 72" by this example comes to carry out the laminating of base material 72a", spacer 72b", and covering 72c" to the order, and the inferior surface of tongue of covering 72c" may have comes to reflect light. As such covering 72c", reflecting layer 72e which consists of aluminum etc. may be formed in the inferior surface of tongue by vacuum evaporationo etc. like this example, and you may produce with metals, such as aluminum, in itself.

[0026] Cutting and lacking spacer 72b" to the part by which the light from a light emitting device 31 is irradiated, the part cut and lacked is a sample cell 724 in base material 72a"and covering 72c". It constitutes. in addition, the piece 72 of an exam -- the ink which carries out the catalyst of the color reaction is not applied to 'base material 72a[of ']".

[0027] According to test piece 72" in this example, it is drawing 8 R> 8 (b). Body fluid is a sample cell 724 by capillarity etc. so that it may be shown. The light which it flowed inside and was irradiated from the light emitting device 31 is a sample cell 724. Inner body fluid is penetrated, it reflects by reflecting layer 72e, body fluid is penetrated again, and light is received by the photo detector 32. By detecting attenuation of the light transmission by body fluid by this photo detector 32, it can measure about the detected matter in body fluid.

[0028] As long as the covering member 73 prepared in the same side as a test piece 72 in the base 7 can prevent that an excessive light goes into this detection section 70 so that the information about body fluid can be optically detected correctly in the detection section 70, it may have what kind of structure. Although the covering member 73 in this example has structure which encloses the detection section 70 with four walls as shown in the decomposition perspective view of drawing 9 , this invention is not limited to this.

[0029] Signs that the light irradiated from the light emitting device 31 reflects in the detection section 70 surrounded by the covering member 73, and is received by the photo detector 32 are shown in drawing 10. By forming such a covering member 73, it can intercept that light other than the light irradiated from a light emitting device 31, for example, the light which leaks from opening which leads outside in the puncture section 3, carries out incidence to the detection section 70, and exact measurement can be performed. If the base 7 which has the puncture cutting edge 71, a test piece 72, and the covering member 73 is made into a dismountable cartridge-type from the body fluid analysis apparatus 1, they can be made throwing away and it will become very advantageous for reasons of sanitation.

[0030] Although the photosensor section 30 is based on what kind of means if the information about body fluid is optically detectable, by this example, the thing using a light emitting device 31 and a photo detector 32 is used for it as an example. Thus, when using a light emitting device 31 and a photo detector 32, as shown in drawing 11, measured value can be determined by irradiating the light of a light emitting device 31 at a test piece 72, and detecting the amount of reflected lights which changes according to color reaction by the photo detector 32, for example, calculating about a time change of color reaction. In addition, if the prism 33 with a high refractive index is used as shown in drawing 12, space which arranges the photosensor section 30 of a light emitting device 31 and photo detector 32 grade can be made small. As a light emitting device 31, a photodiode etc. can be used and a photo transistor, a photodiode, CdS, etc. can be used as a photo detector 32.

[0031] What is necessary is just to choose suitably the wavelength of light irradiated from a light emitting device 31 according to the detected matter in body fluid. In measurement of the blood sugar level in the detection section 70 of a test piece 72 For example, glucose oxidase, A p-nitroso-screw (beta-hydroxyethyl) aminobenzene hydrochloride, The constituent containing molybdophosphoric acid, support, and an organic solvent, and glucose oxidase, A peroxidase, 4-aminoantipyrine, N-ethyl-N -(2-hydroxy-3-sulfopropyl)- Meta toluidine, When the constituent containing support and an organic solvent is applied, as for wavelength, it is desirable that it is 630 - 690 nm. Glucose oxidase, a peroxidase, 4-aminoantipyrine, N-ethyl-N -(2-hydroxy-3-sulfopropyl)- When the constituent containing meta toluidine, support, and an organic solvent is applied, as for wavelength, it is desirable that it is a wavelength field containing either [at least] 400 - 450 nm or 650 - 700 nm. In addition, in this example, although only the light emitting device 31 of 1 is used, if two or more light emitting devices from which wavelength differs are carried out, more exact measurement will be attained.

[0032] Moreover, as a means to change so that the information about the body fluid which bled from the finger can be detected optically, according to an operation of the detected matter in body fluid, the

photogene from which luminescence reinforcement changes can also be used and, in such a case, an excitation light generator and fluorescence, and an ultraviolet radiation detector can also be used as the photosensor section 30. In addition, even if it uses laser and a laser beam analyzer or an optical fiber, an optical power meter, etc., the information about body fluid is optically detectable.

[0033] The puncture cutting edge 71 installed in the base 7 moves forward through the arm member 8 by the drive of the puncture cutting-edge driving gear (this example solenoid) 9 (refer to drawing 2 and drawing 3 (a), and (b)). A solenoid 9 is driven by ON of the puncture switch 52. The point of the puncture cutting edge 71 which moved forward reaches from a base 7 to a front location rather than a projection and a test piece 72. What is necessary is for the amount of protrusions from the test piece 72 of the puncture cutting edge 71 to be in the condition which equipped the body fluid analysis apparatus 1 with the finger, and just to set it up so that the body fluid which the puncture of the finger can be carried out, and it could be made to bleed, and bled can contact a test piece 72. The projecting puncture cutting edge 71 retreats to an early location according to the operation of a flat spring 74 prepared in the base 7. In addition, although the solenoid was used as an approach of driving a puncture cutting edge, in this example, this invention is not limited to this but can make a puncture cutting edge drive by various approaches.

[0034] Drawing 13 is the block diagram showing an example of the circuitry of the above-mentioned body fluid analysis apparatus. The cuff 21 is open for free passage to the pressure sensor, the solenoid valve, the pump, and the leak valve with the rubber tube, and constitutes the pneumatic line from this body fluid analysis apparatus by these. Actuation of each part material in a body fluid analysis apparatus is controlled by the computer. A computer has the function which turns on / turns off a solenoid valve, a leak valve, and a pump, the function incorporate the pneumatic-pressure data detected with a pressure sensor, the function operate a solenoid, the function of making a light emitting device 31 emitting light, the function of functioning, calculating the incorporated signal for which the signal from a photo detector 32 is incorporated, and determining measured value, and the function that output measured value to a drop.

[0035] This computer is programmed so that a pump drives after that predetermined time, while being initialized by ON of a main switch 51 and making a solenoid 9 drive by ON of the puncture switch 52. Moreover, the information on the pressure or body fluid of a cuff 21 detected with the pressure sensor having contacted the test piece 72 is incorporated, or, in accordance with [from ON of a pump] predetermined time, a pump is turned OFF, and a command is issued so that a solenoid valve and a leak valve may be opened. Furthermore, it is programmed to make a light emitting device 31 emit light in a predetermined phase, and the signal from a photo detector 32 is also incorporated according to it. The measured value determined by computer about the incorporated signal is outputted to a drop 4. In addition, it may not pass over this circuitry to an example, and a pressure sensor may not be depending on the case.

[0036] With reference to the flow chart shown in drawing 14 , an example of detailed actuation of the body fluid analysis apparatus in drawing 1 R> 1 is explained. Before starting measurement, an operating personnel inserts a finger into a cuff. a finger -- which finger -- you may be -- moreover, right and left -- you may be which digiti manus. If a main switch is turned on, initialization of systems, such as a clearance of the memory in a computer, will be made.

[0037] Next, an operating personnel turns on a puncture switch. If a puncture switch is turned on, a solenoid drives and a puncture cutting edge projects from a base through an arm member (step 1). The projecting puncture cutting edge returns to the original location according to an operation of a flat spring, after damaging the skin of a fingertip. A pump drives after the protrusion of a puncture cutting edge (step 2), and a cuff is pressurized. This cuff presses a finger and presses out body fluid from the skin which got damaged.

[0038] There are two kinds of approaches in the judgment which hits turning OFF a pump. If the blood

pressure on appearance reaches a predetermined value (P) with the pressure of a cuff, it will consider as Judgment YES the 1st (drawing 14: step 3). In addition, the blood pressure on appearance means the transitional blood-pressure value displayed from a pressure sensor in the process which presses a finger by the cuff. That is, the blood pressure on the appearance which reflects the cuff pressure force directly is detectable with a pressure sensor. More than 120 mmHg of the value of P is desirable, and 180 mmHg extent can obtain bleeding of optimum dose most. Body fluid can be pressed out without according to this 1st approach, being able to define the upper limit of a cuff pressure and giving a superfluous feeling of oppression to an operating personnel irrespective of the size of the finger of an operating personnel.

[0039] If predetermined time (T) progress is carried out after a pump is turned on, it will consider as Judgment YES the 2nd (drawing 15: step 3'). The value of T has about 60 desirable seconds from 5 seconds, and about 20 seconds can obtain bleeding of optimum dose most. A pressure sensor becomes unnecessary in applying this approach.

[0040] If the drive of a pump stops according to the judgment by the 1st or 2nd approach of the above (drawing 14: step 4), ******** and a leak valve will be opened wide and the air in a cuff will be exhausted promptly (step 5). Although ****** [the number of valves / one], by using together a solenoid valve and a leak valve, the air in a cuff can be exhausted quickly and the finger of an operating personnel can be opened from a pressure condition.

[0041] The pressed-out body fluid contacts the point of a test piece 72, and reaches the detection section 70 by capillarity etc. In connection with this, a light emitting device 31 emits light (step 6), and the light reflects in the detection section 70, and is received by the photo detector 32 (step 7). The output from a photo detector 32 is sent to a computer, and starts an operation (step 8). If t hours pass since operation initiation (step 9), it will consider as operation termination (step 10). Since fixed time amount is needed for that measured value is stabilized and calculating measured value, generally the value of t is 1-120. Second extent is needed. If the operation by the computer determines measured value, the measured value will be displayed on a drop (step 11).

[0042] Next, it explains with reference to the flow chart which shows other examples of detailed actuation of the body fluid analysis apparatus in drawing 1 to drawing 16. After an operating personnel inserts a finger and turns on a main switch in a cuff, it turns on a puncture switch. If a puncture switch is turned on, a solenoid drives and a puncture cutting edge projects from a base through an arm member (step 1). The projecting puncture cutting edge returns to the original location according to an operation of a flat spring, after damaging the skin of a fingertip. While a pump drives after the protrusion of a puncture cutting edge (step 2) and pressurizing a cuff, a light emitting device 31 emits light (step 3), and the light reflects in the detection section 70 in a test piece 72, and is received by the photo detector 32 (step 4).

[0043] Although body fluid is pressed out from the skin which the cuff pressed the finger and got damaged, if this body fluid reaches the detection section 70, since the reflection factor in this detection section 70 will change, it is detectable by the photo detector 32 that body fluid reached the detection section 70. A pump will be turned OFF if the pressed-out body fluid reaches the detection section 70 (step 5) (step 6). If the pressurization of a cuff is controlled by this approach, while the body fluid of need 10 daily dose is securable, pressing a finger unfairly by the excessive pressure is lost. In addition, the pressure sensor is unnecessary when turning OFF a pump by this approach.

[0044] If the drive of a pump stops, ******** and a leak valve will be opened wide and the air in a cuff will be exhausted promptly (step 7). On the other hand, the output from a photo detector 32 is sent to a computer, and starts an operation (step 8). If t hours pass since operation initiation (step 9), it will consider as operation termination (step 10), and the obtained measured value will be displayed on a drop (step 11).

[0045] According to the body fluid analysis apparatus of this invention explained above, a series of actuation processes can be reduced and inspection can be finished very easily. Moreover, a means by

which this equipment determines a puncture means, a pressurization means, a means (or a means to detect optically the information about a means to change so that the information about the body fluid which bled from the finger can be detected optically, and the changed body fluid) to detect optically the information about the body fluid with which it bled from the finger, and measured value, And since all the drops that display measured value are provided, a general user does not need skill but can use it easily and quickly. Furthermore, in the body fluid analysis apparatus of this invention, not only the blood sugar level but the various matter in body fluid can be analyzed by changing the class of ink constituent to be used.

[0046] As mentioned above, although this invention was explained to the detail using the drawing, this invention can perform various modification, unless it deviates from the thought of this invention, without being limited to this. For example, you may apply to the equipment not only for the object for fingers but a wrist, an arm, etc. moreover, it is also possible to change into a series of systems until it puts a guide with voice side by side for blind persons, even a switch comes out and it hears a measurement result.

[0047]

[Effect of the Invention] According to the equipment of this invention, a series of processes which measurement takes can be performed automatically and continuously, and body fluid can be analyzed that it is simple and quickly.

[Translation done.]

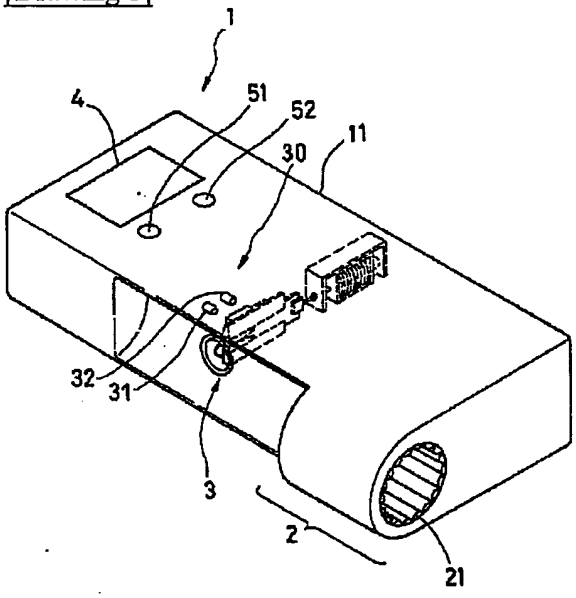
CLAIMS

[Claim(s)]
[Claim 1] The body-fluid analysis apparatus which has the puncture means which carries out the puncture of the finger, the tourniquet for pressing said finger, a pressurization means supply air to said tourniquet, an exhaust-air means exhaust the air of said tourniquet, the pressure sensor that detects the pressure of said tourniquet, a means detect optically the information about the body fluid which bled from the finger, a means determine measured value from the result which detected, and the drop that display the measured value which determined.
[Claim 2] The body-fluid analysis apparatus which has the puncture means which carries out the puncture of the finger, the tourniquet for pressing said finger, a pressurization means supply air to said tourniquet, an exhaust air means exhaust the air of said tourniquet, a means detect optically the information about the body fluid which bled from the finger, a means determine measured value from the detected result, and the drop that displays the determined measured value.
[Claim 3] The puncture means which carries out the puncture of the finger, the tourniquet for pressing said finger, and a pressurization means to supply air to said tourniquet, An exhaust air means to exhaust the air of said tourniquet, and the pressure sensor which detects the pressure of said tourniquet, The body fluid analysis apparatus which has a means to change so that the information about the body fluid which bled from the finger can be detected optically, a means to detect the information about the changed body fluid optically, a means to determine measured value from the result detected optically, and the drop that displays the determined measured value.
[Claim 4] The puncture means which carries out the puncture of the finger, the tourniquet for pressing said finger, and a pressurization means to supply air to said tourniquet, An exhaust air means to exhaust the air of said tourniquet, and a means to change so that the information about the body fluid which bled from the finger can be detected optically, The body fluid analysis apparatus which has a means to detect the information about the changed body fluid optically, a means to determine measured value from the result detected optically, and the drop that displays the determined measured value.
[Claim 5] The body fluid analysis apparatus according to claim 3 or 4 characterized by said means to change so that the information about the body fluid which bled from the finger can be detected optically being a means using color reaction.

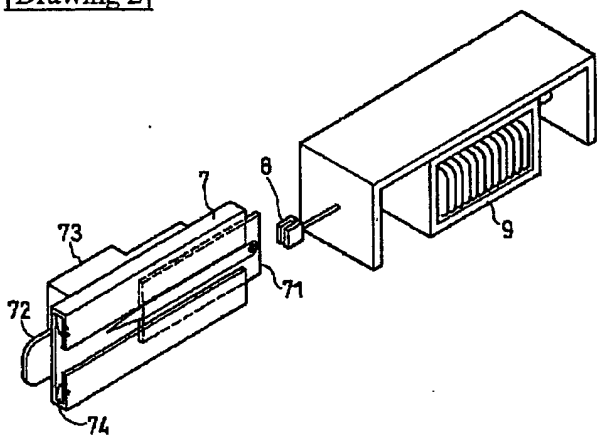
[Translation done.]

DRAWINGS

[Drawing 1]

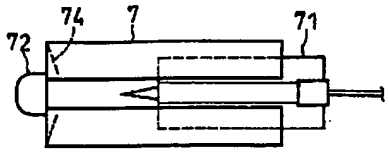


[Drawing 2]

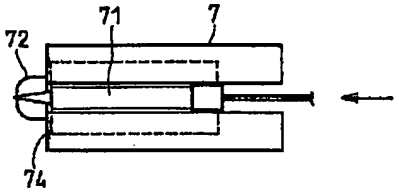


[Drawing 3]

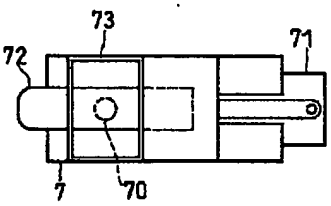
(a)



(b)

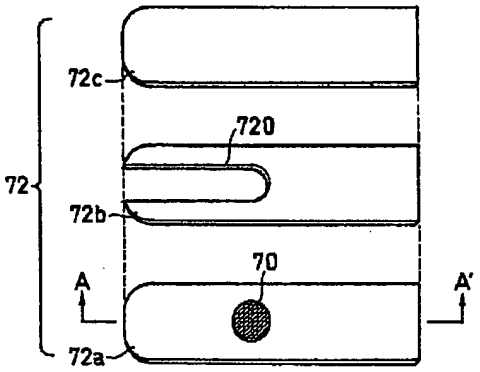


(c)



[Drawing 4]

(a)



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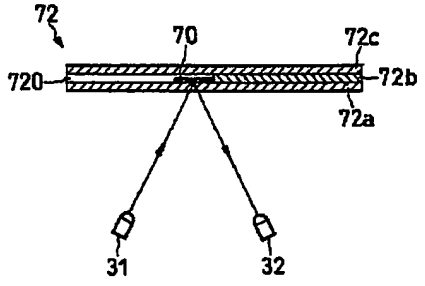
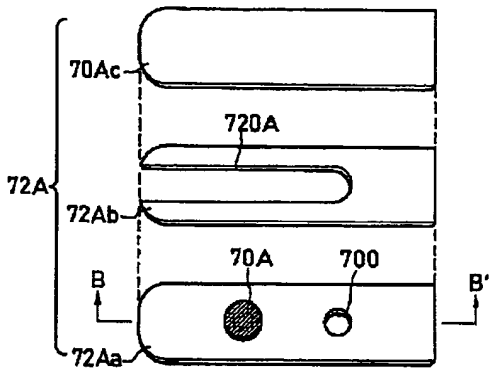


[Drawing 5]

(a)



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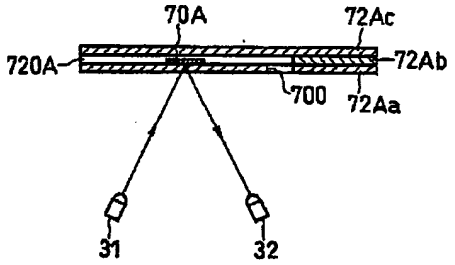
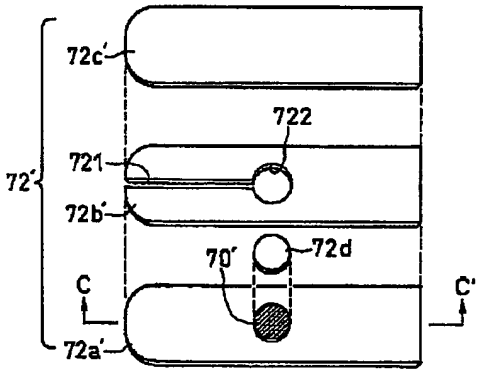


[Drawing 6]

(a)



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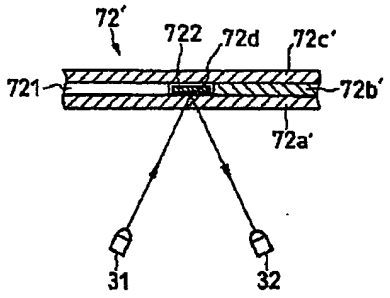
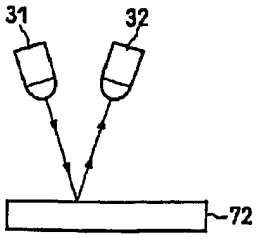
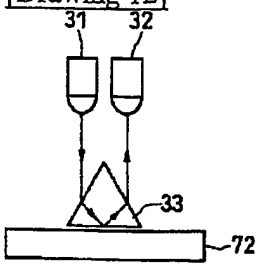


[Drawing 11]

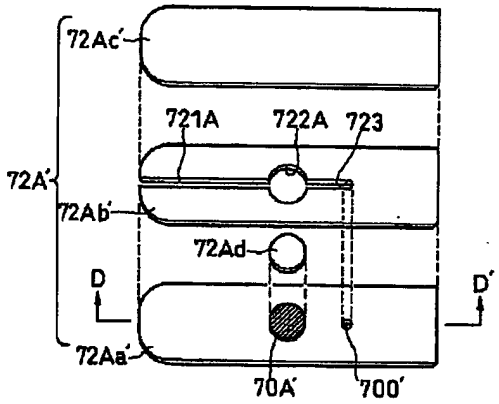


[Drawing 12]



[Drawing 7]

(a)



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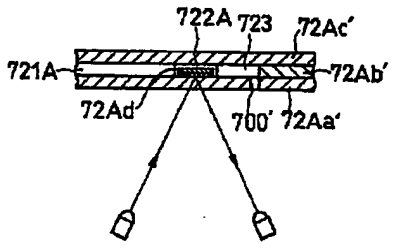
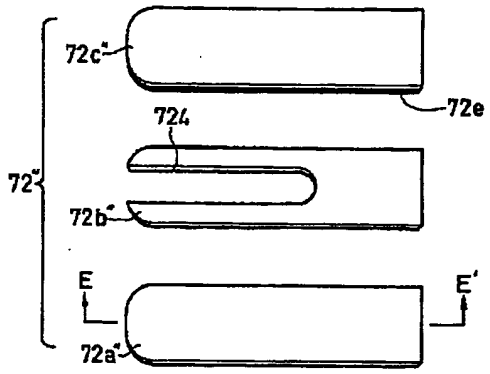


[Drawing 8]

(a)



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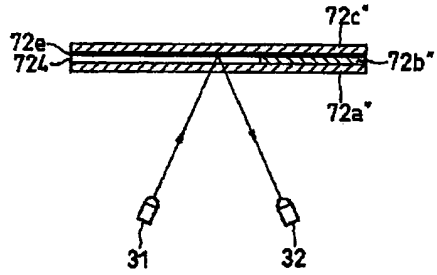
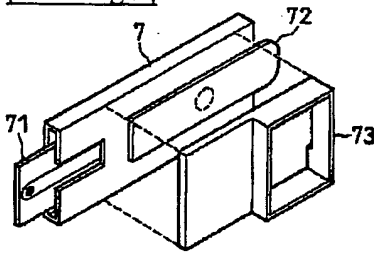
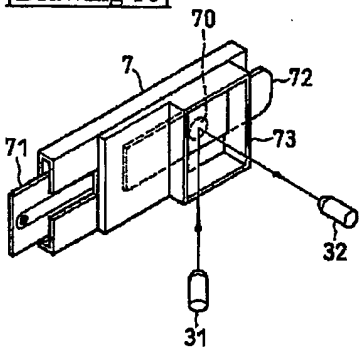


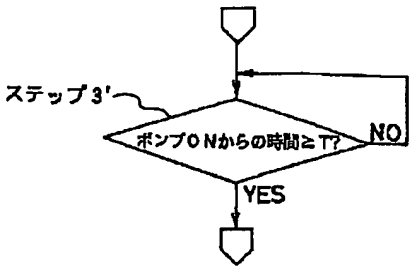
[Drawing 9]



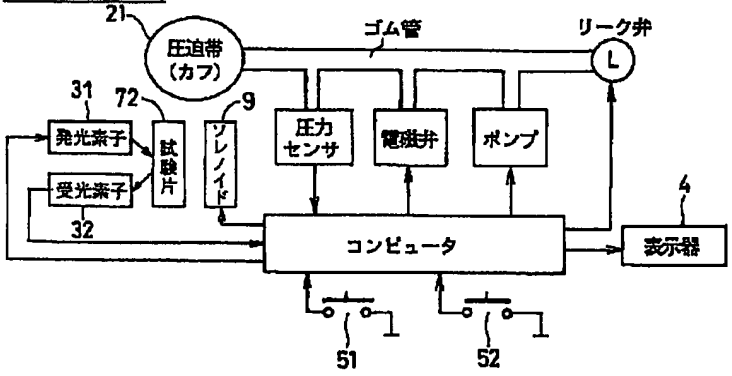
[Drawing 10]



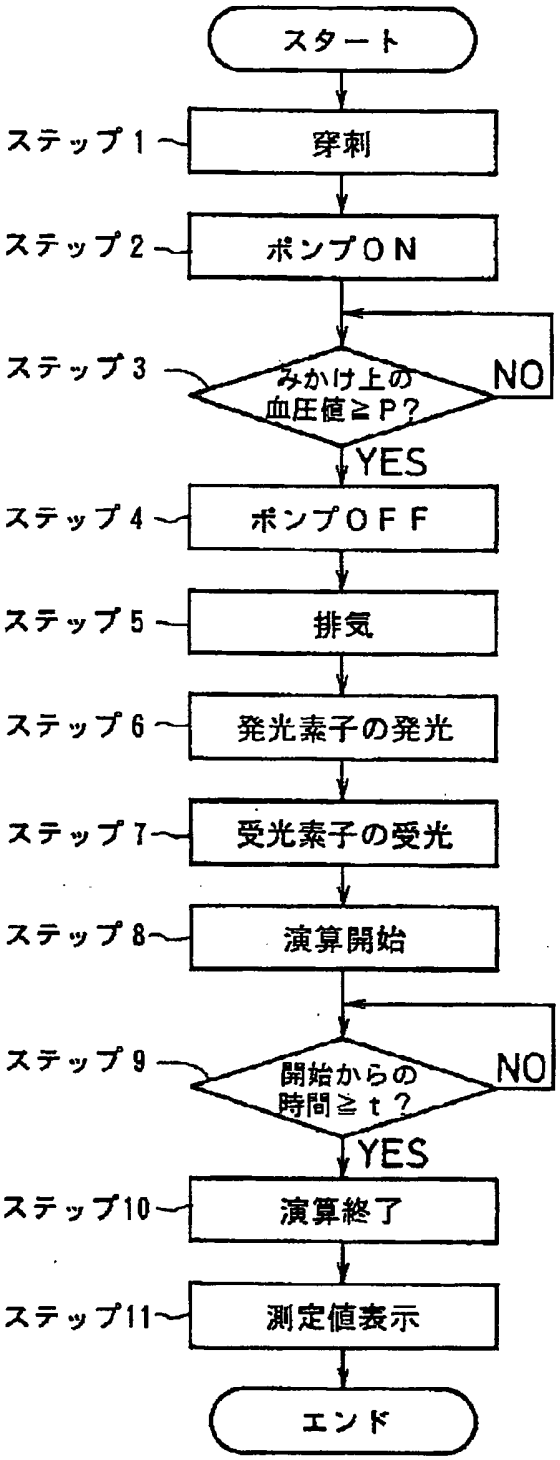
[Drawing 15]



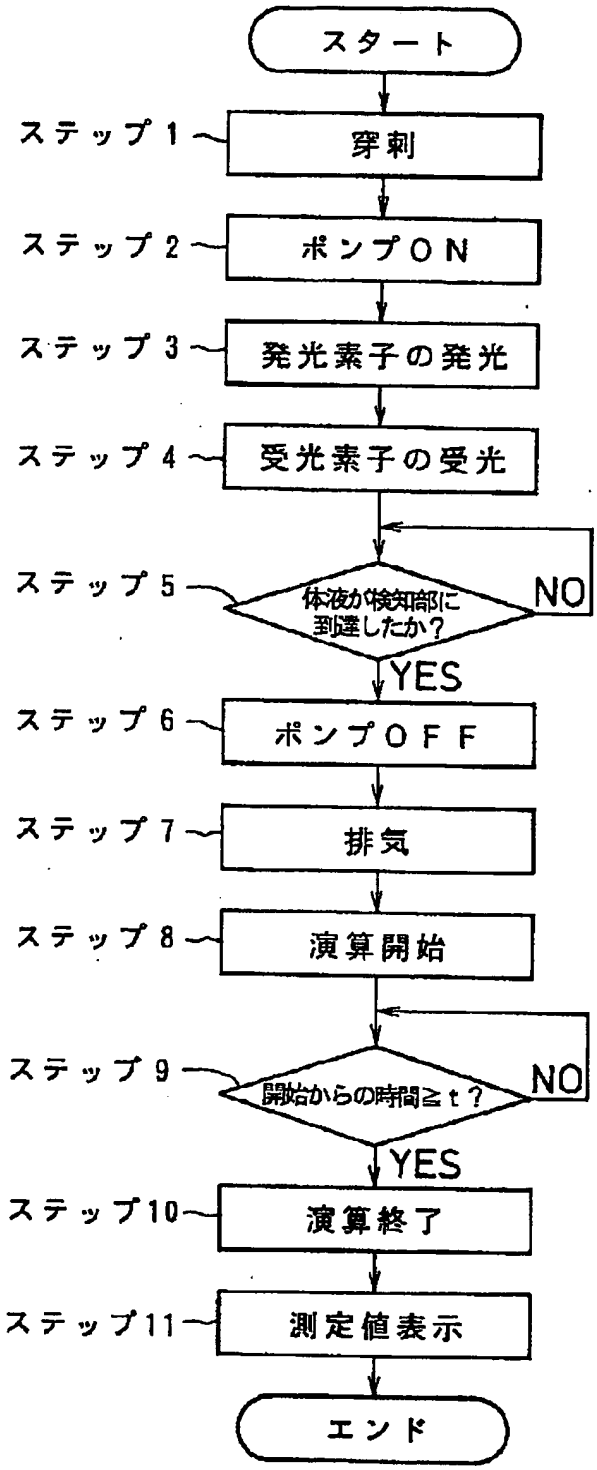
[Drawing 13]



[Drawing 14]


スタート
ステップ1
穿刺
ステップ2
ポンプON
ステップ3
みかけ上の血圧値≧P？
NO
YES
ステップ4
ポンプOFF
ステップ5
排気
ステップ6
発光素子の発光
ステップ7
受光素子の受光
ステップ8
演算開始
ステップ9
開始からの時間≧t？
NO
YES
ステップ10
演算終了
ステップ11
測定値表示
エンド

[Drawing 16]



[Translation done.]